



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/767,282	01/22/2001	Liang-Guo Wang	A4182/T34100	2040

32588 7590 06/24/2003
APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

HASSANZADEH, PARVIZ

ART UNIT	PAPER NUMBER
----------	--------------

1763

DATE MAILED: 06/24/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/767,282

Applicant(s)

WANG ET AL.

Examiner

Parviz Hassanzadeh

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 7,8,10-13,33 and 34 is/are pending in the application.
- 4a) Of the above claim(s) 10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7,8,11-13,33 and 34 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 12 May 2003 is: a) ☒ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☒ Other: approved proposed drawings.

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of Species 1 (frequency modulated signal) of group 1 in Paper No. 9 is acknowledged. The traversal is on the ground(s) that examination of the all pending claims would not be unduly burdensome. This is not found persuasive because as cited in paper No. 5 (restriction requirement) the inventions of groups 1-3 are distinct and have acquired a separate status in the art as shown by their different classification. Further, the special technical features of species 1-3 are distinct and the search required for species 1 is not coexistence with the search required for the other species. It is also noted that claim 10 belong to species 3 (amplitude and frequency modulated signal).

The requirement is still deemed proper and is therefore made FINAL.

Claim 10 is withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, method and apparatus, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 9.

Drawings

The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 5/12/03 have been approved by the Examiner. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 7, 8, 11-13, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ogino et al (US Patent No. 6,471,821 B2) in view of Yamagata et al (US Patent No. 5,362,358) and Miller et al (Electronics The Easy Way, 1995, pages 207-226).

Ogino et al teach a plasma processing apparatus (Figs. 1, 2) comprising:

a power device 30 for generating a frequency modulated signal (a carrier source adapted to generate a first RF signal at a carrier frequency; a modulation source adapted to generate a second RF signal at a modulation frequency; a modulator adapted to modulate the first RF signal with the second RF signal to form a frequency modulated signal); and

a reaction chamber 2 including a stage 6 supporting a wafer 7 thereon, wherein the stage 6 is connected to the RF power source 30 (a plasma processing chamber coupled to the modulator) (abstract and column 4, lines 10-51).

Ogino et al fail to explicitly disclose the details of the frequency modulated power source as comprising a carrier source adapted to generate a first RF signal at a carrier frequency; a modulation source adapted to generate a second RF signal at a modulation frequency; a modulator adapted to modulate the first RF signal with the second RF signal to form a frequency modulated signal; and including a matching network.

Yamagata et al teach a plasma processing apparatus (Fig. 8) including a mechanism for amplitude modulating, wherein a carrier frequency from a power source 50 is mixed with a modulation signal from a pulse generator 94 in a modulation circuit (modulator) 92 (column 6, lines 1-10). Yamagata et al (Fig. 8) further teach an amplifier 90 for amplifying the modulated signal, and an impedance matching network 52 to correct the impedance mismatch between the reactor and the power source.

Miller et al teach how a frequency modulated signal can be constructed by combining the output of a carrier source providing a first RF signal with the output of a modulation source providing a second RF signal (pages 209-211).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the modulator 92 as taught by Yamagata et al and the carrier source and the modulation source as taught by Miller in the apparatus of Ogino et al in order to generate a modulated frequency. It would also have been obvious to one of ordinary skill in the art at the time of the invention to implement the impedance matching network as taught by Yamagata et al in the apparatus of Ogino et al in order to correct for impedance mismatch between the reactor and the power source.

Regarding claim 8: the apparatus of Yamagata et al (Fig. 8) further includes an amplifier 90 for amplifying the modulated signal, and an impedance matching network 52 . Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to implement the amplifier as taught by Yamagata et al in the apparatus of Ogino et al in order to amplify the modulated signal.

Regarding claim 11: as shown in Figs. 12-4 and 12-5 of Miller et al, the modulation frequency (A) is a sine wave.

Regarding claim 12: the apparatus of Ogino et al is a plasma etching apparatus (column 4, lines 28-33 and abstract).

Regarding claim 13: as shown in Figs. 12-4 and 12-5 of Miller et al, the modulating frequency is less than the carrier frequency. For example, in Fig. 12-5, the frequency of signal A (modulating frequency) is less than about 0.1 time the frequency of signal B (carrier frequency).

Regarding claims 33, 34: the frequency modulated signal as taught by Ogino et al is not restricted to a particular range, therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to choose the frequency of the modulated signal within any desire range such as 13.56 MHz which is one of the commonly use frequency in plasma processing of substrate.

Response to Arguments

Applicant's arguments filed 5/12/03 have been fully considered but they are not persuasive.

Applicants assert that adding a single matching network to the reactor of Ogino et al would result in less efficient (total) power delivery and is generally used for allowing a power signal at a "single" frequency to efficiently pass to a process chamber.

The Examiner argues that the motivation for employing a matching network in the reactor of Ogino et al is for the general intended use of a matching network which to correct the impedance mismatch between the reactor (load) and the power source. The matching network may be chosen to be a variable or a fixed frequency matching network, wherein in a fixed frequency matching network, a desire frequency is preferably set to pass to the reactor. The desire frequency in practice may be a small range within the tolerance of the matching network circuit. Thus, one of ordinary skill in the art would chose the matching network for correcting the impedance mismatch between the reactor and the power source when the frequencies of the modulating frequency signals are within the frequency tolerance of the matching network.

Applicants assert that there is no motivation for amplifying the power signal in Ogino et al.

The Examiner argues that the use of amplifier is desirable as it allows operating the power source as a lower initial power level.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

Art Unit: 1763

MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Otsubo et al (US Patent No. 4,808,258) teach a mechanism for producing an amplitude modulated signal, the mechanism includes a modulator , a carrier source, a modulation source, an amplifier and a matching box;

Ogino et al (JP 10-150025), *Ogino et al (US Publication No. 2002/0066537 A1)*, and *Ogino et al (US Publication No. 2003/0000646 A1)* teach a plasma reactor including a power source 30 generating a frequency modulated signal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Parviz Hassanzadeh whose telephone number is (703)308-2050. The examiner can normally be reached on Tuesday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (703)308-1633. The fax phone numbers for the organization where this application or proceeding is assigned are (703)872-9310 for regular communications and (703)872-9311 for After Final communications.

Art Unit: 1763

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703)308-0661.



Parviz Hassanzadeh
Primary Examiner
Art Unit 1763

June 19, 2003